

NATURAL RESOURCE CONSERVATION SERVICE  
CONSERVATION PRACTICE STANDARD

**POND SEALING OR LINING**

**BENTONITE SEALANT**

(No.)

**CODE 521C**

**DEFINITION**

A liner for a pond or waste impoundment consisting of a compacted soil-bentonite mixture.

**PURPOSES**

To reduce seepage losses from ponds or waste impoundments for water conservation and environmental protection.

**CONDITIONS WHERE PRACTICE APPLIES**

This practice applies where:

- Ponds or waste impoundments require treatment to reduce seepage rates, and to impede the migration of contaminants to within acceptable limits; and
- Soils are suitable for treatment with bentonite.

**CRITERIA**

**General Criteria Applicable to All Purposes**

Bentonite-treated soil liners shall be planned, designed, and installed to meet all federal, state, local, and tribal laws and regulations.

Lined structures shall be constructed to meet all applicable NRCS standards. All inlets, outlets, ramps, and other appurtenances shall be installed in a manner that does not damage or impair the proper operation of the liner.

Bentonite-treated soil liners shall be filter compatible with the natural foundation materials on which they are compacted according to the National Engineering Handbook, Part 633 (Soil Engineering) Chapter 26 (Gradation Design of Sand and Gravel Filters), or an equivalent recognized industry standard.

The minimum thickness of the finished compacted liner (as measured perpendicular to the finished surface) shall be six inches. Thicker liners shall be constructed in multiple layers. The final compacted thickness of each individual layer shall not exceed six inches, and each layer shall be compacted before the next layer is placed.

The bentonite shall be a sodium bentonite with a free swell of at least 22 milliliters as measured by ASTM Standard Test method D5890, unless laboratory tests using other bentonite types are used for design.

When laboratory permeability tests are required to determine application rates, the tests shall be performed using bentonite of the same quality and fineness as that proposed for use.

For protection against bentonite dust, personnel on site during bentonite application and mixing shall wear a mask and goggles.

**Criteria Applicable to Waste Impoundments**

**Design** - Design of bentonite-treated soil liners for waste impoundments shall be based on guidance set forth in the National Engineering Handbook Series, Part 651 (Agricultural Waste Management Field Handbook), Chapter 10 (Agricultural Waste Management System Component Design), Appendix 10D (Geotechnical, Design, and Construction Guidelines), and in compliance with applicable state and local criteria and regulations.

**Liner Protection** - The liner shall be protected against desiccation cracking, the effects of water surface fluctuations, wave action, surface erosion, erosion from pipe inlets, agitation equipment, animals, or items installed through the liner. Protective measures shall be designed into the system to protect the liner for these cases. At least six inches of compacted soil cover shall be placed over the soil-bentonite liner.

### Criteria Applicable to Ponds

For ponds, in the absence of laboratory tests or field performance data on soils similar to those to be treated, the minimum application of finely ground bentonite per one-inch thickness of constructed liner shall be:

Pervious Soil Description	Application rate (lb/ft <sup>2</sup> )
Silts (ML, CL-ML)	0.375
Silty Sands (SM, SC-SM, SP-SM)	0.5
Clean Sands (SP, SW)	0.625

**Liner Thickness.** In the absence of more detailed testing and analysis, liner thickness shall be according to the following table:

Water Depth (feet)	Liner Thickness (inches)
8 or less	6
8.1 – 16	12
16.1 – 24	18
24.1 - 30	24

### CONSIDERATIONS

Flattening the slopes of ponds or waste impoundments to facilitate compactive efforts during construction should be considered. The stair-step method of construction as outlined in National Engineering Handbook Series, Part 651 (Agricultural Waste Management Field Handbook), Chapter 10 (Agricultural Waste Management System Component Design), Appendix 10D (Geotechnical, Design, and Construction Guidelines) may be considered in lieu of slope flattening.

A protective compacted soil cover should be considered for protecting the soil-dispersant liner for ponds.

Consider using a flexible membrane liner for sites that have water depths greater than 24 feet.

### Endangered Species Considerations

Determine if installation of this practice with any others proposed will have any effect on any federal or state listed Rare, Threatened or Endangered species or their habitat. NRCS's objective is to benefit these species and others of concern or at least not have any

adverse effect on a listed species. If the Environmental Evaluation indicates the action may adversely affect a listed species or result in adverse modification of habitat of listed species which has been determined to be critical habitat, NRCS will advise the land user of the requirements of the Endangered Species Act and recommend alternative conservation treatments that avoid the adverse effects. Further assistance will be provided only if the landowner selects one of the alternative conservation treatments for installation; or at the request of the landowners, NRCS may initiate consultation with the Fish and Wildlife Service, National Marine Fisheries Service and/or California Department of Fish and Game. If the Environmental Evaluation indicates the action will not affect a listed species or result in adverse modification of critical habitat, consultation generally will not apply and usually would not be initiated. Document any special considerations for endangered species in the Practice Requirements Worksheet.

### Water Quantity

1. Effects upon components of the water budget, especially effects on volumes and rates of runoff, infiltration, evaporation, transpiration, deep percolation, and ground water recharge;
2. Variability of the practice's effects caused by seasonal or climatic changes;
3. Effects on downstream flows or aquifers that would affect other water uses;
4. Potential use for water management to conserve water.

### Water Quality

1. Effects on the surface and subsurface movement of sediment, pathogens, and soluble material from the pool area;
2. Effects on the movement of dissolved substances below the pool area toward surface and groundwater;
3. Effects on the visual quality of downstream water resources;
4. Short-term and construction-related effects of this practice on the quality of the pool and downstream water;
5. Effects on wetlands or water-related wildlife habitats.

**PLANS AND SPECIFICATIONS**

Plans and specifications for bentonite treated soil liners for ponds and waste impoundments shall be in keeping with this standard and shall describe the requirements for applying the practice to achieve its intended purpose. Plans and specifications shall include such drawings, specifications, material requirements, quantities, construction requirements, equipment requirements, and other documents as are necessary to describe the work to be done.

**OPERATION AND MAINTENANCE**

Maintenance activities required for this practice consist of those operations necessary to prevent damaging the treated soil liner. This includes, but is not limited to, excluding animals and equipment from the treated area, protection of the liner during initial filling, agitation or pumping operations, and repair of disturbed or eroded areas.